May Change Microelectronics Fabrication

New Polymers Allow Self-Developing Photoresists

A novel class of silicon-based polymer materials that "self-develop" upon exposure to ultraviolet (UV) light has been discovered by John Zeigler of Chemistry of Organic Materials Division 1811 and Larry Harrah of Physical Chemistry and Mechanical Properties of Polymers Division 1812.

The discovery may lead to a self-developing photoresist material — an advance that could eventually eliminate several costly and troublesome steps in the manufacture of the circuitry on silicon chips.

And that advance could lead in turn to commercial chips that cost less to make and are more free of defects.

The development also points a way toward simplified manufacturing of Very Large Scale Integrated (VLSI) circuits with line widths less than one micron — a goal of circuit designers who want to pack more electronic components into less space.

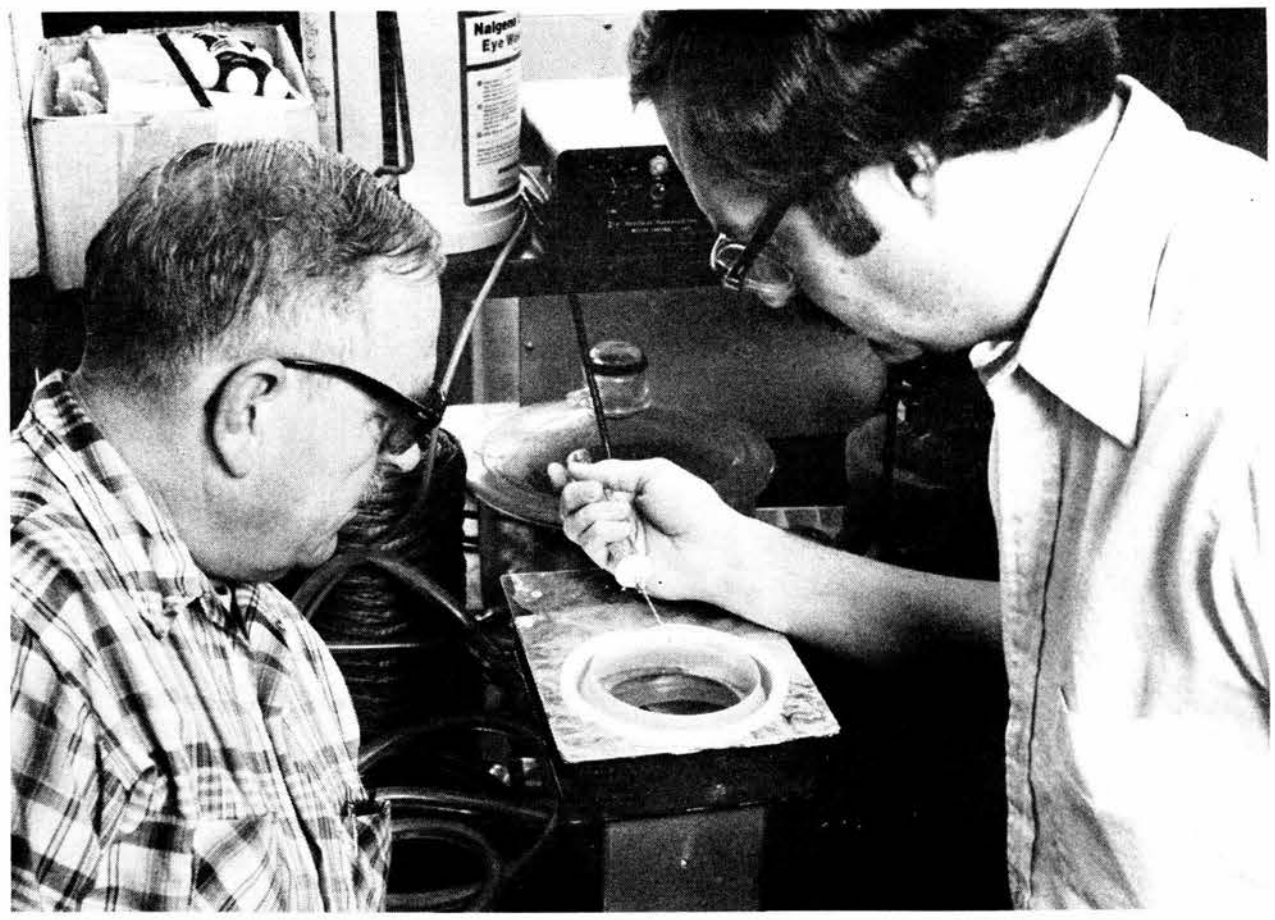
Patent applications have been filed in the US and in several other countries.

The materials that hold such great promise are a new class of polysilane copolymer. Polysilane copolymers consist of long chains of two kinds of simple units, or monomers, based on silicon. They can be synthesized from inexpensive and readily available chemicals widely used in the manufacture of silicone rubbers.

"What we found was that when the polysilanes are subjected to deep UV light, they photodecompose and volatilize," says Larry. "That is, they break into smaller molecules that vaporize as nontoxic waste gases. Where the UV light hits, in other words, the material disappears."

When a film of the polysilane is applied to a surface and UV light is allowed to strike it in a certain pattern, that pattern is then reproduced as a positive image. The portion of the film shielded from the light remains;

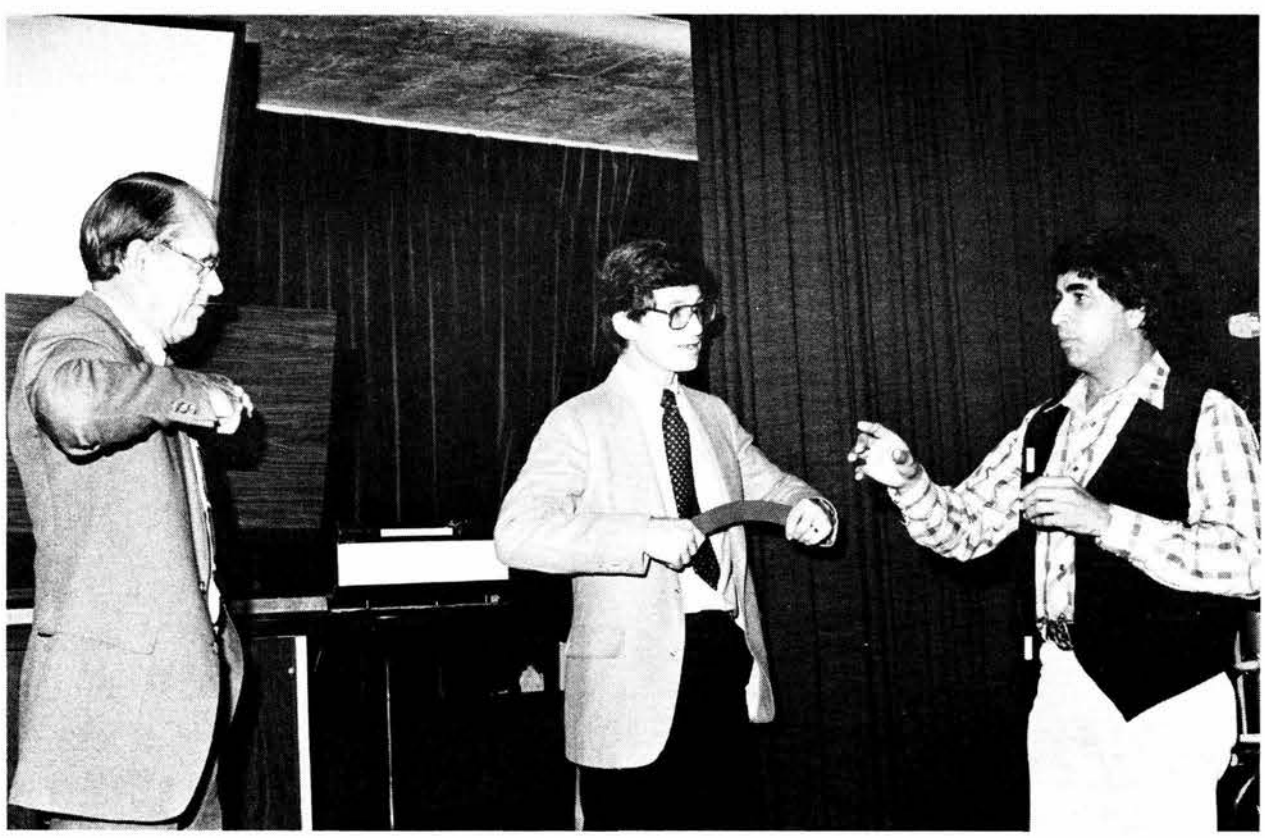
(Continued on Page Four)



POLYSILANE PHOTORESIST is injected into spin caster via syringe by John Zeigler (1811) as co-developer Larry Harrah (1812) looks on. New silicon-based photoresist is self developing and may lead to significant improvements in the fabrication of microcircuits. (Spin caster is typical method of depositing a photoresist on a silicon wafer.)

LAB NEWS

VOL. 36 NO. 23 SANDIA NATIONAL LABORATORIES NOVEMBER 9, 1984



SANDIANS' MAGIC WORKS AGAIN! Following the announcement that Sandians had exceeded the one million dollar ECP goal, magician Don Marchi (2312) entertained guests at the ECP Wrap-Up luncheon. He was ably assisted by two volunteers—VPs Orval Jones (5000), left, and Everet Beckner (6000), center.

ECP Campaign Wrap-Up

More Than A Million Pledged

The 1984 ECP Campaign was a record-breaking success. The one million dollar goal was exceeded by $132,772. Fair Share giving (0.6 percent of salary) increased from 43.5 percent to 44.6 percent; percentage of Sandians giving to ECP increased from 85.1 to 86.9 percent. The average individual contribution is $156.

"These figures indicate that Sandians care about their community," says drive chairman Ed Franzak (7240). "We achieved our goal; in fact, it was a record, and it was certainly appreciated by the United Way and the many agencies benefiting from the generosity of Sandians. I want to offer the thanks of the entire ECP committee to all employees for that generosity."

Antojitos

Hail to Thee, Alma Mater Last month I attended the 25th reunion of my college class. It was a bit disconcerting--a bunch of middle-aged people apparently got invited somehow. But it reminded me, as a communicator, that college magazines always feature notes on the doings of the alumni and that these notes seldom tell me what I'd really like to know about my classmates vs. the real world. Instead of limiting the notes to the "TF was recently selected to locate prospective Nobel prize winners in biology in the English-speaking world" genre, I'd like to know about the rest of us ordinary folks. Something like:

JH continues to search for a mechanic who will believe her when she tells her mechanic that she knows her water pump bearing is going out when it whines in E flat.

ST is as depressed as he was in college. He recently faced that fact that his children regressed toward the mean and are only normal.

BC continues to impress congregations with his ability to memorize his sermons. No one has yet discovered his secret--that he can't write legibly enough to read his notes in the pulpit.

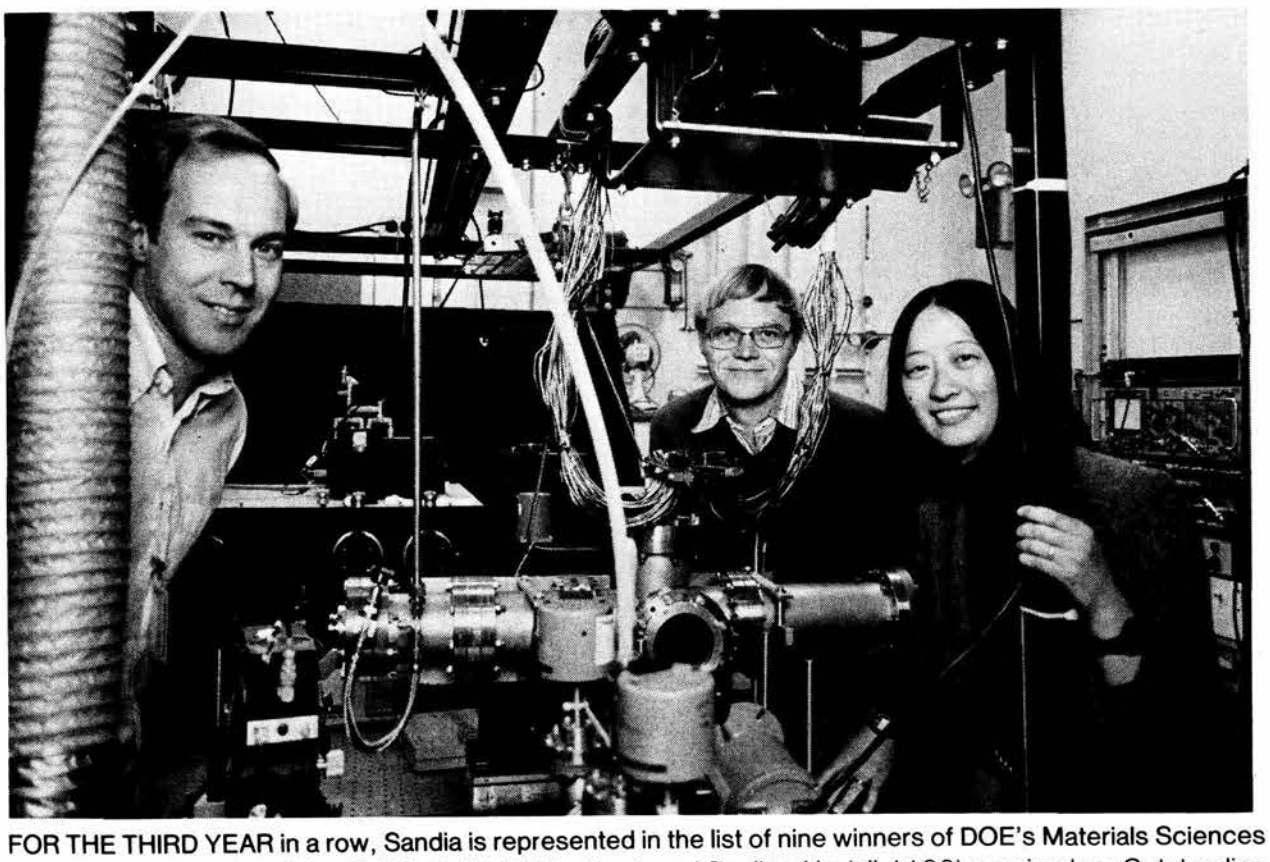
AM wonders if anyone ever found the engraved Cross pen she lost near Old Main when she was a sophomore. After all, it had her name on it and was almost certainly found by another student and maybe he or she has had a change of heart . . . .

JB still resents having been forced to take biology. She's now earning a six-figure income in a field that has nothing to do with biology. "What I needed was a good microeconomics class," she reports.

Well, you get the picture. In my own case, the magazine could report that "BH is still fooling around with words and letting them get him in trouble. But not as seriously as the time he posted the fake college bulletin on the announcement board--the one that said the cafeteria was being investigated by the SPCA." ●BH

* * *

La plupart des hommes emploient la première partie de leur vie à rendre l'autre misérable. (French: Most men spend the first half of their lives in such a way that they make the second half miserable.)



FOR THE THIRD YEAR in a row, Sandia is represented in the list of nine winners of DOE's Materials Sciences Research Competition. Mike Coltrin (left), Bill Breiland, and Pauline Ho (all 1126) received an Outstanding Scientific Accomplishment award in the Materials Chemistry division. Their paper was entitled "Fundamental Mechanisms of Chemical Vapor Deposition." Last year's winners were George Thomas, Bill Wilson (both 8341), Mike Baskes (8332), and Mike Knotek (1134). 1982 winner was Keith Brower (1111).

Supervisory Appointment

ERIC HASKIN to supervisor of Safety and Environmental Studies Division 6415, effective Nov. 1.

Eric has been a member of the technical staff at the Labs since April 1980. His work has been in reactor safety research, most recently in Reactor Safety Technology Division 6411.

He received a BS and PhD in nuclear engineering from Kansas State University. Eric is a member of the American Nuclear Society. Bicycling is his primary recreation. Eric and his wife Suzanne have a son; they live in the SE heights.

Fun & Games

Running — Alan Bolles (5146) took third place in the 60-over category in the recent Albuquerque Marathon. Roque Feliciano (7551) took third in the 50-59 age group. Charles Jakowatz (315) finished the 26-mile plus run in the 30-39 bracket.

Another run for charity, this one sponsored by the Animal Humane Association, is scheduled Sunday, Nov. 11. It's a five-mile run or a two-mile walk starting at 10 a.m. at the corner of Louisiana and Los Angeles. You can run with your dog on a leash if you'd like. It's an all-dirt and rolling hills course. Entry fee is $7 before the race, $8 the morning of the run. Entry forms are available at Gil's Runners Shoe World or the LAB NEWS office, Bldg. 814.

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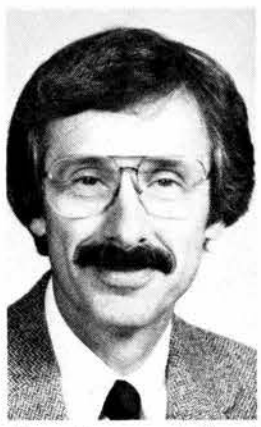
Supervisory Appointment



MARSHALL LAPP to supervisor of High Temperature Interfaces Division 8352, effective Oct. 1.

Marshall came to Sandia a year ago to work in combustion science and materials programs. His professional career began with GE's Research and Development Center at Schenectady, N.Y., where he worked most recently on the development and application of Raman scattering for flame diagnostics; he was also acting manager of the combustion unit there.

Marshall earned his bachelor's degree in engineering physics at Cornell and his PhD in engineering science at Cal Tech. He is a Fellow of the American Physical Society, the Optical Society of America, and the Institute of Physics in the United Kingdom.

He and his wife Margery live in Walnut Creek. He has two sons, one at the State University of New York and the other attending high school in New York State. Marshall's outside interests include hiking, tennis, and photographic history and literature.

Fun & Games

Golf — Corey Knapp (8171) has been elected president of the Sandia Employees Golf Club for the 1984-85 season. Vice president will be Rodger Page (8164), secretary Jan Inzerilla (8025), treasurer Sharron Tyler, (8024), and handicap chairperson Paula Neighbors (8274).

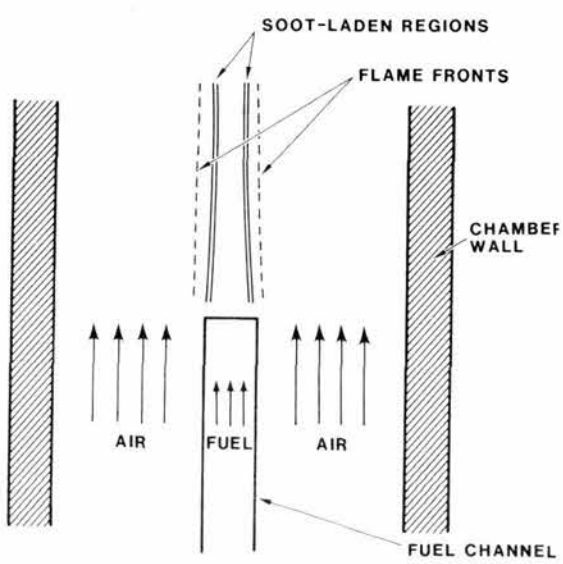
Congratulations

Gayle Short (8310) and Ron Allen (8262), married in Reno, Oct. 18.

Deborah Burge (8452) and Byron Linnell, married in Maui, Oct. 12.

Sympathy

To Doris Pouard (8024) on the death of her husband in Livermore, Oct. 23.



TEST APPARATUS allows study of soot formation in high-pressure combustors.

First High-Pressure Experiments

Soot Studied at CRF

Sandia researchers are using advanced laser diagnostic techniques to show how soot in a flame increases with pressure.

This knowledge could play a role in better controlling or even eliminating soot — solid carbon particles — produced during combustion. Soot spoils visibility, blackens cities, and impairs health, to say nothing of wasting fuel.

Combustion systems that operate at high pressures — whether they be engines or combustors for gas turbines — have a tendency to produce more soot than similar low-pressure systems.

In recent years, researchers at the Combustion Research Facility (CRF) have been working to identify just how soot forms. As a result of a joint effort among researchers within the DOE's combustion programs, universities, and industry, some critical questions about soot are beginning to be answered.

Past studies have investigated soot's behavior at atmospheric pressure, but not in high-pressure conditions similar to those experienced by actual equipment, such as diesel engines and gas turbines.

The CRF experimenters, however, have changed that — they examined soot formation processes under more realistic, pressurized combustion conditions.

The studies indicate that pressurized flames produce larger and more numerous soot particles than do non-pressurized combustors. Ongoing soot generation experiments will seek to uncover the underlying chemical mechanisms that promote soot formation.

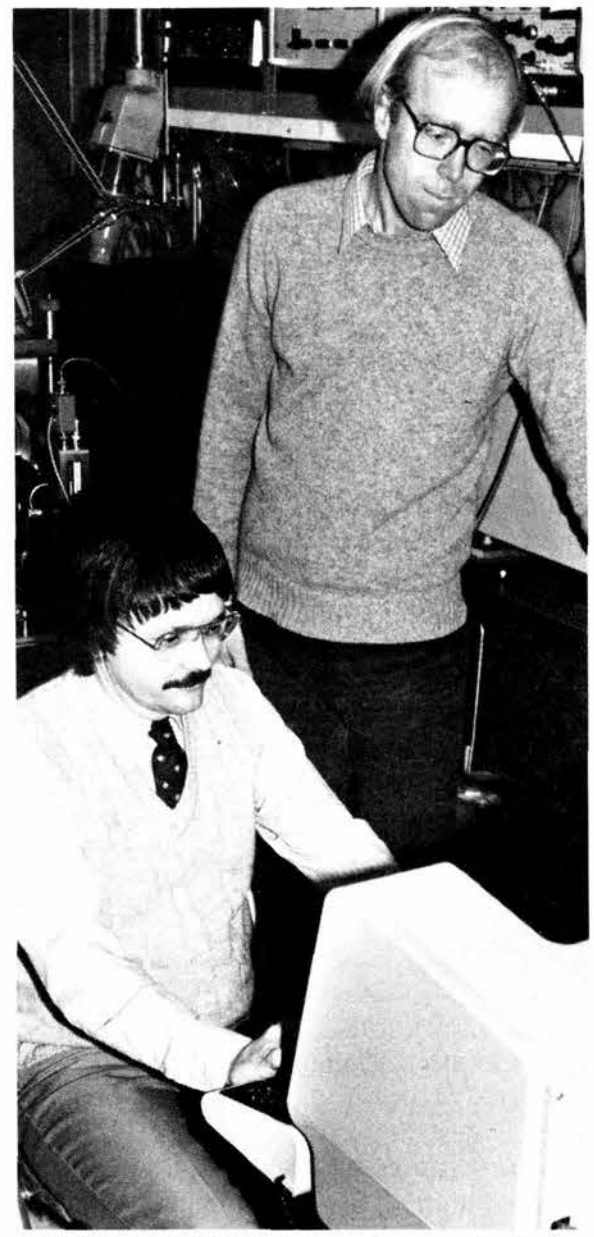
Bill Flower (8351), one of the chief scientists studying soot, says, "Although we have confirmed through these experiments that soot increases with pressure, we still do not know precisely what triggers those mechanisms."

In the future, researchers hope to conduct experiments at significantly higher pressures. These tests would simulate even more closely the actual environment of many combustion engines and turbines.

"With the knowledge gained from these activities, better combustion systems can be developed by industry partners who are helping to guide the CRF research," Bill says.

The recent experiments basically involved passing a laser beam through carefully controlled, soot-laden flames in a test chamber where pressures could be varied. Researchers compared characteristics of the laser beam — intensity and frequency, for instance — as it entered and emerged from the flame.

The diagnostic techniques measured soot particle size, number density (particles per unit volume), and volume fraction (percent of volume occupied by particles).



VISITING PROFESSOR Tom Bowman (sitting) of Stanford assisted Bill Flower (8351) in studying the formation of soot in a high-pressure combustor. Here they review data from the lasers that measure soot particle size, number of particles per unit volume, and the percent of the volume occupied by soot particles in the flame. Earlier soot studies were performed at atmospheric pressure.

The experiment chamber featured four fused-silica windows through which the combustion process could be viewed and recorded. During each test, gaseous ethylene flowed upward through a burner slot and into the combustion chamber. The fuel slot was surrounded by passages for air flow, which allowed for ignition from a pilot flame and continued combustion.

"This experiment provided significant advances in understanding the details of combustion proceses," says Dan Hartley (8300). "By doing this type of work, we can provide industry with the scientific understanding that will lead to improved efficiency in present and future combustion systems, and help in the redesign of combustion systems to make use of future, less ideal fuels."

Continued from Page One

New Polymers Allow Self-Developing Photoresists

the portion exposed to the light is removed.

Larry and John realized that this characteristic could give polysilanes great potential as a photoresist in the microelectronics industry. (A photoresist is a thin layer of photosensitive material applied to, for instance, a silicon wafer and exposed to light that is projected through a mask bearing the pattern of a circuit.) In a subsequent process, material is removed from (or deposited on) the area that is not covered by the film, leaving desired features such as circuit lines and connections.

"The great advantage of the polysilanes as photoresists is that they're self-developing," says John. "The circuit image is etched onto polysilane films immediately upon exposure to the UV light — in about a second, say." Commercial photoresists have to go through a solvent development process — much like photographic film developing — before the image in the resist is created. The solvents are expensive and difficult to work with, and they tend to degrade the resolution (the size of the smallest reproducible features) because they cause the polymer to swell, sometimes obliterating some of the circuit information. Although elimination of solvent development is a major advantage, the polysilanes are sufficiently flexible in use that they can be solvent developed if a particular application demands it.

Later tests confirmed that the new polysilanes were indeed self-developing and photopatternable. And Larry's photophysics studies demonstrated that their sensitivity to UV light — their "photochemical quantum yield" — is extraordinary: for every photon of UV light that strikes their surface, six monomer units of material are removed. "This is 20 to 60 times more sensitive for material removal than are typical commercial materials with solvent development," says Larry.

Furthermore, the polysilanes are sensitive only to UV light. This means they won't degrade in ordinary light so darkrooms aren't necessary.

Their sensitivity to deep UV has another important advantage: the shorter the wavelength of light a photoresist is sensitive to, the finer the resolution possible in the resulting circuit pattern. Tests by Wayne Johnson (1126) show that some of these materials are capable of resolving submicron features. And Pat Appel and T. A. Allen (both 7475) have demonstrated that even low intensity hand-held UV lamps produce a useful image in the polysilane films that can be effectively transferred to a copper substrate.

The new polysilanes also have greater thermal stability than most present photoresists. They remain intact to at least 350° C. Chemically, they are stable in the presence of both oxygen and solutions of stannous chloride or iron chloride (common photoprocessing solutions). They are also strong, and they adhere well to the common substrates — quartz, silicon, and aluminum.

"The fact that our materials are self-developing means that we can do away with the solvent development step and subsequent baking step in making microelectronic circuits," says John. "Eliminating these steps would be a big gain."

In addition to the cost advantage, the polysilanes avoid the environmental problems associated with the handling and disposal of solvent developers.

Since each step of the chip-making process may be repeated four or five times to make a finished circuit, the effect of cutting out even one step is significant. "Self-developing photoresists could greatly simplify the integrated circuit manufacturing process," says John. "And every step cut out not only makes the process cheaper but usually increases the productivity by reducing the number of rejects."

That reduction is possible because of the greater resolution and the elimination of the solvent development process. Currently, only about 30 percent of the circuits manufactured are defect free; the rest have to be discarded. A success rate improvement of a few percent could have significant effect on production costs.

Both John and Larry agree that the first commercial application could come as early as a year or two from now. They believe the self-developing photoresists will be used first to reduce costs in the manufacture of fairly simple integrated circuits. Later, they may be used to produce finely detailed VLSIs, packing more than a million transistors onto one chip.

Self-Developing Photoresists

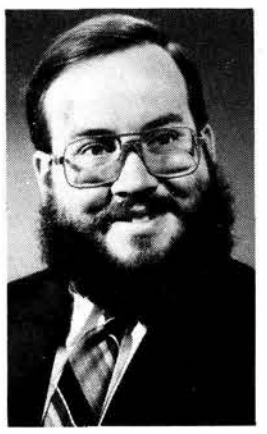
Old Search, New Discovery

A self-developing or dry-developing photoresist has long been sought by the semiconductor industry. A few potential dry-developing materials have been examined over the past 10 years, but they have suffered from several problems. They were relatively insensitive to UV light, so their light sensitivity needed to be boosted by adding chemical sensitizers. They were also relatively unstable, and many were found to give off toxic, corrosive products — hardly desirable in a factory environment. "They just haven't found their way into application," observes John.

The self-developing photopatternable polysilanes discovered by John and Larry appear to avoid at least some of the problems encountered with the previous dry-developing materials. Toxicity, for example, appears to be no problem. "We found that they do not give off materials that are toxic or corrosive," says John. "Their volatile products are a type of silicon, which tends to be very chemically inert and nontoxic. They're not even a skin irritant."

Researchers at IBM's laboratories in San Jose have recently investigated polysilane materials of the same class as those studied at Sandia but with slightly different structures. However, the IBM workers have not reported any self-developing characteristics for their polysilanes.

Brian Dodson To Sing Nov. 17-18 In OPERA Production



An ambitious program of opera selections will be presented Nov. 17-18 by a relatively new group on the Albuquerque music scene. Brian Dodson (1131) will sing the role of Rodolfo in *La Boheme*, the showpiece of the evenings' presentations.

Organized two years ago, OPERA, (Opera Performers' Ensemble for Recreation in Albuquerque) is a dedicated music workshop organization for students and performers.

"The upcoming show will be a professional effort," Brian says, "featuring some fine voices and performances. We have prepared a program of scenes and selections from various operas — *La Boheme, Hansel and Gretle, Il Trovatore, Barber of Seville, Don Carlo,* and *La Gioconda.*"

Brian started singing at grad school at the University of Illinois, participating in an opera workshop for about four years. He earned his PhD in physics in 1980 and joined Sandia. Since he has been in Albuquerque he has appeared in productions of the Vortex theatre and in *Brigadoon* and *Pirates of Penzance* presented by ACLOA. He will be in ACLOA's *Hans Christian Andersen* show during the Christmas holidays.

Curtain time for the OPERA production is 8:15 p.m. at the Unity of Albuquerque, 9800 Candelaria NE. Tickets are $3.50.

Take Note

A Fall Open House will be held at the APS Career Enrichment Center on Nov. 15 from 6 to 8 p.m. Anyone interested in learning more about the Center is invited to attend. Guided tours, planetarium shows, special demonstrations, and refreshments are on the agenda. The Career Enrichment center is located at 807 Mountain Rd. NE, just south of the Albuquerque High School tennis courts. For more information, call 247-3658 or 247-3659.

* * *

The first meeting of the reactivated Albuquerque chapter of IEEE/Computer Society will be held Nov. 12 at 7:30 p.m. in room 201 of the UNM EE building. Guest speaker will be William Heflin, President of New Mexico Technet, Inc. All IEEE or ACM members are invited to attend. Anyone interested in joining the chapter should attend this meeting or contact John Jensen (2645), chapter secretary, on 4-1472.

* * *

The Bureau of Conferences & Institutes at UNM's Division of Continuing Education offers the following workshops/seminars during November:

1200 - Introduction to Micro Computers (beginning dates: Nov. 12, 13, 26, and 27).

1204 - Using the Personal Computer as a Word Processor, Nov. 27.

1205 - Electronic Spreadsheet Using Visicalc, Nov. 13.

For registration and fee information, call the Conference Registrar, 277-3751.

* * *

An all-new collection of four distinctive Christmas cards is being offered by the Easter Seal Society of New Mexico. The works of four Southwestern artists are featured in full color on the cards, with sale proceeds supporting services for the disabled served by the Society.

The 1984 series includes the reproduction of "Midnight Prayer" by Gail Maio, Albuquerque; "Taos Morada" by Walt Gonske, Taos; "Pueblo Christmas" by Dyanne Strongbow Weber, Albuquerque; and "Old Town Luminarias" from an original photograph by Timothy Taschwer, painted by Art Pressman, Albuquerque.

Cards cost 40 cents each, with one half of that amount considered a donation to Easter Seals. A brochure/order form illustrating the full color cards is available at the LAB NEWS office (Bldg. 814).

* * *

DOE/AL has selected Wackenhut Services, Inc., a private firm specializing in security operations, to operate DOE's Central Training Academy. In September, Sandia transferred control of the Live-Fire Range, located in a remote area near Coyote Canyon, to DOE (LAB NEWS, Sept. 14). The LFR became part of the Central Training Academy.

CTA will provide DOE with consolidated and standardized training in various security disciplines such as arrest authority/use of deadly force, physical protection, officer survival, tactical response, hostage negotiation, and explosive ordnance disposal. The Academy will administer a certification for all security force supervisors throughout DOE and its contractors. It will also provide advanced training programs on a variety of safeguards and security topics of concern to senior DOE officials.

Wackenhut has named William Meincke to serve as Vice President and General Manager of CTA. Meincke is currently president of Security Consulting Firm of Albuquerque. Wackenhut currently maintains protective service contracts with DOE at NTS and the Savannah River Plant in Aiken, SC, and with NASA's Kennedy and Johnson Space Centers.

Roy Crouch is the DOE's director of the CTA.

* * *

The monthly meeting of the NM Section of ASME will be held Nov. 15 at Mama Mia's Ristorante Italiano, 1430 Carlisle Blvd. NE. Melvin Eisenstadt, an Albuquerque attorney and registered professional mechanical engineer, will discuss the Legal Aspects of Alternate Energy Sources. Social hour begins at 6 p.m., followed by dinner ($7.50) at 7. No reservations are required; non-members, guests, and relatives are welcome.

* * *

KAFB's Arts and Crafts complex announces the following activities:

Nov. 18, 4th Annual Arts & Crafts Christmas Festival, 11 a.m. to 4 p.m., Ballroom at the Enlisted Club.

The following activities require registration one week in advance; call 4-0222.

Nov. 19, Motorcycle Service Workshop, 6:30-8:30 p.m., Auto Hobby Shop.

Nov. 20, Macrame Workshop, 6-8 p.m., Arts & Crafts Center.

Nov. 23, China Painting on Porcelain Figurines, 1:30-4:30 p.m., Arts & Crafts Center.

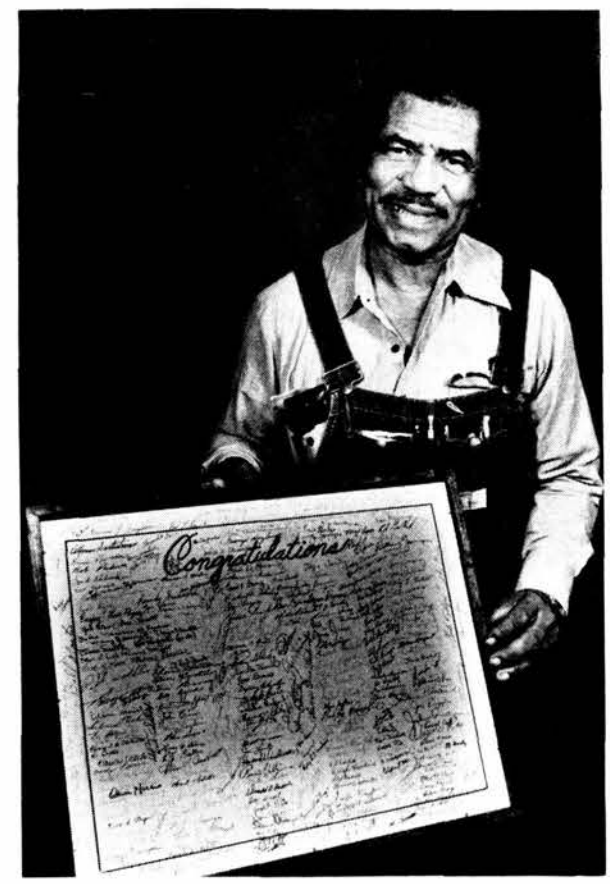
* * *

Help. It's the time of year again that the LAB NEWS must think about a Christmas cover. Our Christmas issue, the only one using full color, will be published Friday, Dec. 21, the last day before Sandia's holiday break. If any Sandian has a painting or drawing that might be appropriate for the season, we'd like to see it right away. Call 4-1053 to arrange a time.

* * *

The South 14 Bookstand — UNM Press has just published *Rebels on the Rio Grande*, the Civil War journal of A.B. Peticolas who was a sergeant in the Confederate Army participating in the invasion of New Mexico. The journal is edited by former Sandian Don Alberts, now Chief of the History Division, Air Force Operations Test Center, KAFB. The journal is the only extant eyewitness account of the rebel campaign from the battle of Valverde, through the capture of Albuquerque and Santa Fe, the battle at Glorieta Pass, and the retreat of the rebel column down the Rio Grande. Alberts has contributed a lengthy introduction to the work and numerous footnotes detailing the geography, tactics, and significance of the campaign. The book may be examined in the LAB NEWS office in Bldg. 814. Cost is $9.95.

The Museum of Albuquerque is hosting a reception and autograph party for the author on Saturday, Nov. 17, from 2 to 4 p.m. The public is invited.



JESSE WADDLES (3423) was a happy man last week when hundreds of well-wishers showed up at his retirement reception. Jesse worked at Sandia for 31 years, retired to pursue private business interests. Here he displays signatures of co-workers collected at the reception.

* * *

Luckily for the consumer, "reliability" and "maintainability" are becoming household words these days. Whether applied to major weapon systems or to toasters, TV sets, or vehicles, the two words are vital to customer satisfaction. The annual Reliability & Maintainability Symposium provides a forum where R & M engineers can talk with each other and with their management counterparts about ways to strengthen their roles in the design and manufacture of durable goods and software that customers will accept.

The theme of the 1985 Symposium (Jan. 22-24 in Philadelphia) is "R & M — The Key To Customer Satisfaction." Sponsored by nine technical societies, it's the largest R & M symposium in the U.S. For more information, contact Jack Wiesen (7200), a member of the Board of Director's Long-Range Planning Committee, or H. C. Jones, general chairman, Westinghouse Electric Corp., MS 3608, P.O. Box 1521, Baltimore, MD 21203.

* * *

Some wilderness trail out there is crying out for adoption. You can learn how to go about it by attending the workshop tomorrow at the Rio Grande Nature Center from 9:30 to 3. It's sponsored by the Volunteers for the Outdoors and the NM Natural Resources Department. Call Karen Voigt on 344-1151 for more info.

Plane Truth

In some situations, we are all equal. Air travel is a good example.

Muhammed Ali, on a recent United Airlines flight, made it clear he had no intention of fastening his seat belt. "Superman doesn't need a seat belt," he commented to the diminutive stewardess.

"Superman doesn't need to take a plane," she replied.

Ali buckled up.

Journal of American Insurance

Chief Scientist

Yonas Accepts SDI Post

Gerry Yonas, former director of Pulsed Power Sciences, 1200, is now on the job in Washington after having accepted the post of Chief Scientist with the administration's Strategic Defense Initiative Office. He reports to the SDIO head, Gen. James Abrahamson, who in turn reports to Caspar Weinberger, the Secretary of Defense.

Gerry's new position lacks neither challenge nor controversy. To succeed, the SDI must refute some well established points of view and re-examine some well entrenched policies and strategies. "We'll be asking questions that were asked 10 years ago — shall the US keep all its eggs in the MAD [mutually assured destruction] basket, or should we proceed with a ballistic missile defense program?" Gerry notes. "The answer to the latter question then was negative; we chose to go with MIRVs [Multiple Independently targeted Reentry Vehicles] instead. But today we'll be asking the question again in light of a new situation."

The situation is new in terms of both politics and technology. As Gerry points out, the US has just gone through a frustrating search for a survivable basing mode for the MX. Beyond that, arms control discussions with the Soviets have broken down — and at a time when they're testing antisatellite weapons themselves. They've also recently completed a very large radar, which may well be a violation of the current ballistic missile defense [BMD] treaty, and they're pushing ahead with ground-based lasers.

At the same time, the US technologies that could have defensive applications have advanced in the last 10 years. But have they advanced far enough? "We're not talking about the kind of technological challenge you face when you know exactly what and where the target is," says Gerry. "When you're trying to land a man on the moon, for example, you know that when you get to the moon it will still be there. But with SDI we're talking about a moving target, an offensive capability that can change both qualitatively and quantitatively. That kind of evolving threat affects the requirements for defensive technology."

Hitting and destroying an ICBM in flight, for example, would be difficult, but an even greater challenge would be managing the battle. That would take computer systems: hardware and software to take perhaps 100,000 objects in the form of data from the sensors, put the data into a decision-making computer structure, and then use that computer structure to engage weapons and keep track of targets — which targets are alive? which targets are dead? And this whole process would take, say, half an hour.

"We're talking here about the most massive software job that man has ever faced," says Gerry. "It would probably require new methods of artificial intelligence to write software that would take data from the sensors and act on that data automatically.

"But if that capability were to be developed, think what it could mean to, say, air traffic control. Think about having satellite systems to observe air traffic on a global scale, put those data into a master computer that can make adjustments for weather or equipment failure, and then arrange the necessary rescheduling, send flight plans to pilots, and so forth. In other words, if we can create a battle management system for SDI, we can change many kinds of complex statistical processes where real-time data are coming in and we don't know how to handle them.

"Then think about the energy requirements for SDI: we would need to have reliable portable energy supplies that could provide perhaps hundreds of megawatts of power on command, just exactly where we need it, for a very short time. If we had that portable energy supply, think what else we could do with it," says Gerry.

"And don't forget the new materials that would have to be developed. I think a society that uses these SDI-related technologies will be a very sophisticated, advanced society in the next century.

"There are other considerations: there will likely be technological breakthroughs on the offensive side of the equation; and at the same time, we'll be trying to investigate new ways to use our achievements in R&D to find avenues for improved steps toward arms control.

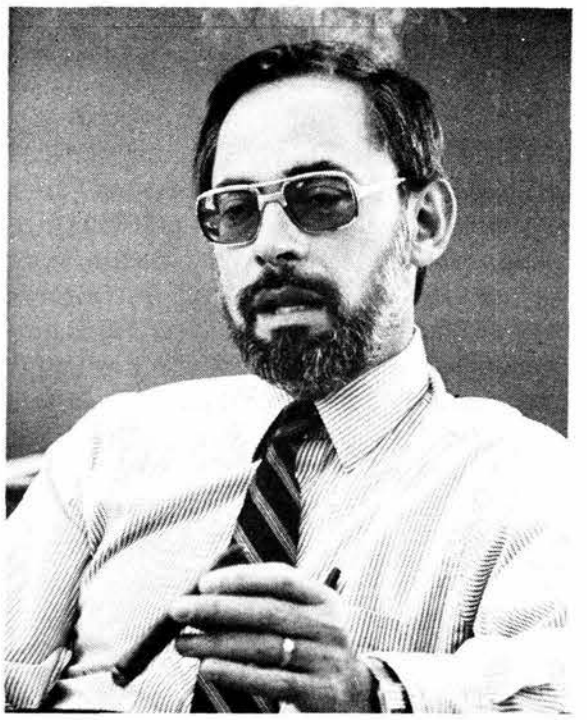
"So, given that moving target I mentioned, what we're trying to pursue is a long-term research program to establish the limits to technology. Our immediate goal is to strengthen deterrence. Our long-term goal is to make ballistic missiles, both ours and theirs, militarily useless through a combination of enlightened policy and breakthrough technology."

The new direction Gerry will be a vital part of obviously has a technological base. But it's also grounded in policy, strategy, and philosophy. It will take new institutional methods, new means of streamlining the often cumbersome, entrenched ways of doing things in the military-industrial complex. That challenge excites Gerry, and he believes that Gen. Abrahamson is committed to breaking away from the traditional approaches.

"What fascinates me is the coupling of technology and policy strategy," Gerry points out. "After all, the whole idea of deterrence is based on perceptions, thought processes, ideologies. Working directly with such ideas is an intellectual stimulus, and that intellectual stimulus is what really make me tick.

"I've learned that technology evolves — whether we like it or not. And that our ability to couple our institutional fabric to this evolving technology — to know what is happening to us, what technology is doing, and how to deal with it as human beings — is the real gut issue.

"Creating the philosophical framework that evolves along with the technology is one of our biggest problems. We seem to blunder into things — as I said before, technology could have given us BMD, had we chosen to go that way and de-emphasize strategic offensive weapons. Where is the coupling between the technology and the way we actually manage our human relations? I'm saying now, let's try to strengthen our cerebral capabilities in terms of policy and strategy as we strengthen our capabilities in terms of technology."



CHIEF SCIENTIST Gerry Yonas is in a contemplative mood as he discusses his new post with the Strategic Defense Initiative Office.

Success in making rapid advances in the R&D program that is SDI will, its proponents believe, bring the US and the USSR back to meaningful arms negotiations. "SDI is a new option that will force both sides to think more clearly about strategic weapons," says Gerry, "and to start to shift away from the current situation — which is not as stable a deterrent as it used to be.

"I can foresee — speaking optimistically now, and, oh yes, I'm absolutely an optimist — a future with single warhead deterrent missiles and with substantial ballistic missile defenses so neither side can conceive of any military benefit from a preemptive strike. Then I see an evolution of more capable defensive systems and fewer offensive systems, until we finally negotiate away offensive nuclear ballistic missiles.

"After all, what choice do we have? Right now we have very few options. If the Soviets make large improvements in their offensive capability, what response can we make? We have to continue to improve our offensive weapons — higher precision, better command and control, faster reaction times. What does that do? It puts the world on a hairtrigger. It puts us that much closer to suffering a possible preemptive strike and to considering such options as launching a counterattack when our sensors and computers tell us we are under attack. The real question is not 'Will we survive the next 20 years?' but 'Will we survive the next century if we continue investing strictly in offensive technology?' "

The current program of the SDIO does not violate the ABM [anti-ballistic missile] treaty; the program is not going into the engineering phase. Rather it will seek the limits to defensive technologies so the nation can decide whether it should proceed with the engineering phase. "That's at least five years from now," says Gerry. "That's the time for concerns about reconsidering the ABM treaty, for concerns about new treaties.

"But I still think we have no choice but to pursue the research if only as a hedge against Soviet developments — and I am certain the Soviets are very serious about BMD. It's only prudent to do this kind of re-

(Continued on Next Page)

Continued from Previous Page

Yonas Now SDI Chief Scientist

search to see whether or not we can create new technological options."

Although the SDI program is managed by the DoD, the DOE, and the various military services in labs and industry throughout the country, Gerry hopes to broaden the involvement of creative people from the national labs and from universities. "We will try to establish a way to challenge and involve the innovative juices that may be bottled up out there in academia and the labs and get other creative people to contribute to the program.

"So far, the universities just don't seem to know that the goal is to create a defense-dominated, rather than a offense-dominated, nuclear deterrent; that we're trying to create a technology not to kill people but a technology to kill missiles; that we want to move away from a policy of mutually assured destruction. If they knew that, they would know that the key is a truly credible technology. And that requires breakthroughs in engineering and science, breakthroughs that could revolutionize non-defense activities as well. We could use their talent in the program; I hope they come aboard."

Gerry is a logical choice for the Chief Scientist post. He earned his PhD in engineering science from the California Institute of Technology in 1966. He directed research on high-current electron beams at Physics International before joining Sandia in 1972. To join the SDI effort, he has recently been assigned to the DoD.

His most recent position at Sandia was director of Pulsed Power Sciences 1200, a position, incidentally, that took him to the USSR frequently during the last 12 years. Gerry was a member of the Defensive Technologies Study Team that spent last summer in Washington exploring the frontiers of the technology now known as SDI (See LAB NEWS, Oct. 28, 1983).

He also critiqued the final report on that study for Gen. Abrahamson last April. "When the general asked me to be his Chief Scientist, it took me about a millisecond to say 'Yes,' " Gerry reports.

'Five Centuries of Masterpieces' Opens at Museum in January

The Armand Hammer Collection, "Five Centuries of Masterpieces," will be on exhibit at the Albuquerque Museum from Jan. 27 through March 24, 1985. This exhibition of paintings and drawings by some of the world's greatest artists — Rembrandt, Rubens, Michelangelo, Dürer, Van Gogh, Degas, Gauguin — has traveled to almost 20 countries where it has been seen by over three million people.

There is no charge for viewing the collection. In order that as many people as possible see the exhibit, 125 tickets for entrance into the East Gallery will be available every 30 minutes during Museum hours. The tickets will be dated, and the entry time will be designated. Reservations are strongly recommended. Reserved tickets will be held at the Museum until 30 minutes before the entry time designated. If the tickets have not been claimed by that time, they will be made available on a standby basis to Museum visitors. Individuals may reserve up to four tickets in their own name; call 766-4905 or stop by the LAB NEWS office (Bldg. 814) to pick up a brochure and reservation request.

The Museum will be open on an expanded schedule for this exhibit. Hours will be from 10 a.m. until 5 p.m. on Tuesdays, Thursdays, and Saturdays; 10 a.m. until 9 p.m. on Wednesdays and Fridays; and 1 p.m. until 5 p.m. on Sundays. The Museum is closed Mondays. Final admission time will be one hour before closing.

Half-hour recorded tours of the exhibition are available; units with headphones (available on a first come-first served basis at $2) provide explanations of the works and their historical context. A 28-minute film will show continuously in the auditorium; "Let a Thousand Flowers Bloom" is a documentary of the Armand Hammer Collection's tour to mainland China in 1982. A complete catalogue, with color illustrations, is available at La Tienda, the Museum gift shop, for $25. Posters featuring selected works from the exhibition are available for $5.

Stanford Announces Science Fellows Program

The Center for International Security and Arms Control at Stanford University announces its Science Fellows Program. This program is designed to create opportunities for mid-career scientists with strong technical backgrounds and an interest in arms control and international security policy to spend one or two years in residence at Stanford University pursuing research, and working with the Center's senior faculty and research staff. Recipients will have an opportunity to interact with many eminent arms control, political, military, and technical experts who work or visit at the Center.

The Center plans to award two fellowships for 1985-86. The purpose of the program is to train scientists with strong technical capabilities for participation in U.S. policy planning in the fields of arms control, international security, and defense policy and planning. A strong interest in these areas is therefore considered essential. Scientists in academic and research institutions, government, and the private sector are encouraged to apply. Fellowships may be awarded for one- or two-year periods and will not be renewable. The deadline for completed applications if Feb. 15, 1985; the awards will be announced about March 15. LAB NEWS (Bldg. 814) has application information.

We Will Serve No Wine *After* Its Time, Either

Here's a little news to relieve one of life's major social concerns. Did you know that most good wines are meant to be consumed *before* they are seven years old? By purchasing older, more expensive vintages you may be paying for simple fashion rather than for quality. Any wine, no matter how popular the year, may be a waste if its age exceeds the palatable seven-year mark.

Journal of American Insurance

INTRICACIES of the rocket sled test track are explained by Dave Bickel (7535) to (from left) John Zeglis, Mike Greene, Bob Park (4010; behind Greene), and Quin San Hamel (4000). Zeglis, currently an AT&T Technologies executive vice-president and acting general counsel, will replace George Cook, who retires on Jan. 1, as executive vice-president and general counsel of AT&T Technologies and as a member of Sandia's board of directors. Greene is assistant general counsel, AT&T Technology Systems. Along with Cook and Al Zigler, associate general counsel and secretary of AT&T Technologies, Inc., Zeglis and Greene were briefed on Sandia's nonclassified programs during the visit.

Take a Day Off

Great American Smokeout Countdown Continues

by Arlene Price (3330)

It's almost here! The day of the Great American Smokeout! The day you can take the pledge to quit smoking for 24 hours on Thursday, Nov. 15. If you think you can use some help, follow Larry Hagman's suggestion — he's the national chairman of GAS for the fourth consecutive year as well as J.R. in "Dallas" — and find someone to "adopt" you so you can get moral support to help you through the day.

Last year more than 80 Sandians took the pledge to quit smoking for a day. At a three-month follow-up, 35 percent were still not smoking. Maybe this year you too can join the growing ranks of Sandians who have become nonsmokers.

At Sandia, the GAS is sponsored by the Medical Department, assisted by the Friends of Health Committee. Join us for the festivities by attending a special panel on smoking on Thursday, Nov. 15, 11:30 to 12:30 p.m. in Bldg. 815 (outside the Tech Area) with panelists Dr. Larry Clevenger, associate medical director (3322); Arlene Price (3330), in charge of the Quit-Smoking Program; and special guests Tasia Young, director of the Commission on the Status of Women; and Marilyn Zanetti, principal of Jefferson Middle School. Topics include trends in illness patterns, trends in women's smoking, and teenage smoking. (Spouses welcome!)

the Great American SMOKEOUT

Pledge cards, Adopt-a-Smoker forms, and tips on quitting will be available in major buildings (802, 822, 836, 840, 880, 892 and the Coronado Club). "Survival kits" (gum, mints, nuts, raisins) donated by Servomation, the vending machine supplier, will also be available for the first 200 who take the pledge. For really professional help, Dr. Ed Cazzola (3320) will be on hand in Bldg. 880 from 12:30 to 2 p.m. to answer any questions and encourage you on your way. Or, go "cold turkey" with the Sandia cafeteria cold turkey special.

For follow-up assistance, sign up for Medical's next Quit-Smoking class Nov. 26 through Dec. 19, Mondays and Wednesdays, 12 noon to 1 p.m. in Bldg. T13. To enroll, call Arlene at 6-0021 or join Medical's Nicorette support group — the next meetings are Nov. 14 and 30 (Bldg. T13, Rm 9) and Dec. 12 and 19 (Coronado Club Staff Room, next to the cafeteria), from 12 to 1 p.m. Call Laura at 4-7169 for further information.

Department of Energy
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico 87115

OCT 24 1984

Dr. George C. Dacey
President
Sandia National Laboratories
P. O. Box 5800
Albuquerque, NM 87185

Dear Dr. Dacey:

The Department of Energy met all weapon production pegpoints for FY 1984. This is a significant achievement and an important contribution to national security.

We would like to extend our personal thanks and congratulations to you and your staff for the key role that the Sandia National Laboratories played in making FY 1984 such a successful year.

The weapons production mission is an ever-challenging one, which demands dedication and commitment. Your support of this mission has been outstanding as usual.

The future success of our programs will depend on our continued commitment to getting the job done. I am confident that the Sandia National Laboratories will continue to instill excellence in the weapons program.

Sincerely,

R. G. Romatowski

R. G. Romatowski
Manager

feedback

Q. Sandia Labs now schedules vacations on a fiscal year basis. Each September there is a last-minute rush to get all vacation time cleaned up for non-union employees since they can't carry over vacation days to the following fiscal year.

I suggest returning to a calendar year period for scheduling vacations. It would encourage more vacation time being taken in October because some employees are cautious about using vacation too early in the fiscal year.

Supervisors would be able to spread vacations over the fall period, and more people would be on the job in September.

A. Your observations are correct. However, a study we made several years ago shows that the same problems prevailed when we moved the vacation year from fiscal to calendar and back to fiscal year.

With the human factors being the same no matter when the vacation year ends (e.g., "hold some back just in case . . ." or "maybe management will change the rule . . ."), the decision to keep the vacation year concurrent with the fiscal year was influenced by budgetary considerations. With vacations on a calendar year basis, the carryover between fiscal years could be substantial with no satisfactory way to predict employee plans at the time the budget is formulated. If each employee carried over only one day, the added charges to the preceding year would be about $1 million.

Present policy provides solutions for the problems you mentioned. Employees can either borrow or carryover vacation when justified. The high approval level required for carryover is to ensure that it is indeed necessary — again, this is for budgetary control.

P.M. Stanford — 100

Q. There are no Feedback forms or holders for them in Area IV. In Building 823, where I worked for a year, there were never any forms in the holder. How come?

A. Please accept my apologies for the lack of Feedback forms in your work areas. As you know, Sandia is a big place and, since Feedback is a one-person operation, I must rely on employees to let me know (1) if no forms remain in a particular holder, and (2) if new holders are needed at a specific work site.

I have remedied the Bldg. 823 problem by placing more forms there, and will make arrangements to put a Feedback holder in Bldg. 960 when the bulletin board area is established there.

Meantime, if you need to write a Feedback and no forms are readily available, just send it in on a plain sheet of paper. It will be processed in the same way as those on regular forms, and your anonymity is guaranteed as always.

Phyllis Wilson - 3161
Feedback Coordinator

Only One in Nevada

Diwiatt Barker Builds Classic Car Replica

Essentially, Diwiatt Barker (7171) is tooling around Las Vegas, Nev., in a brand new 1937 Jaguar SS100 sports car. He built it himself during nine months of weekend and evening labor in his garage. It has a 1984 new car registration, the only one in the state reading 1984 Modern 1937 Jaguar.

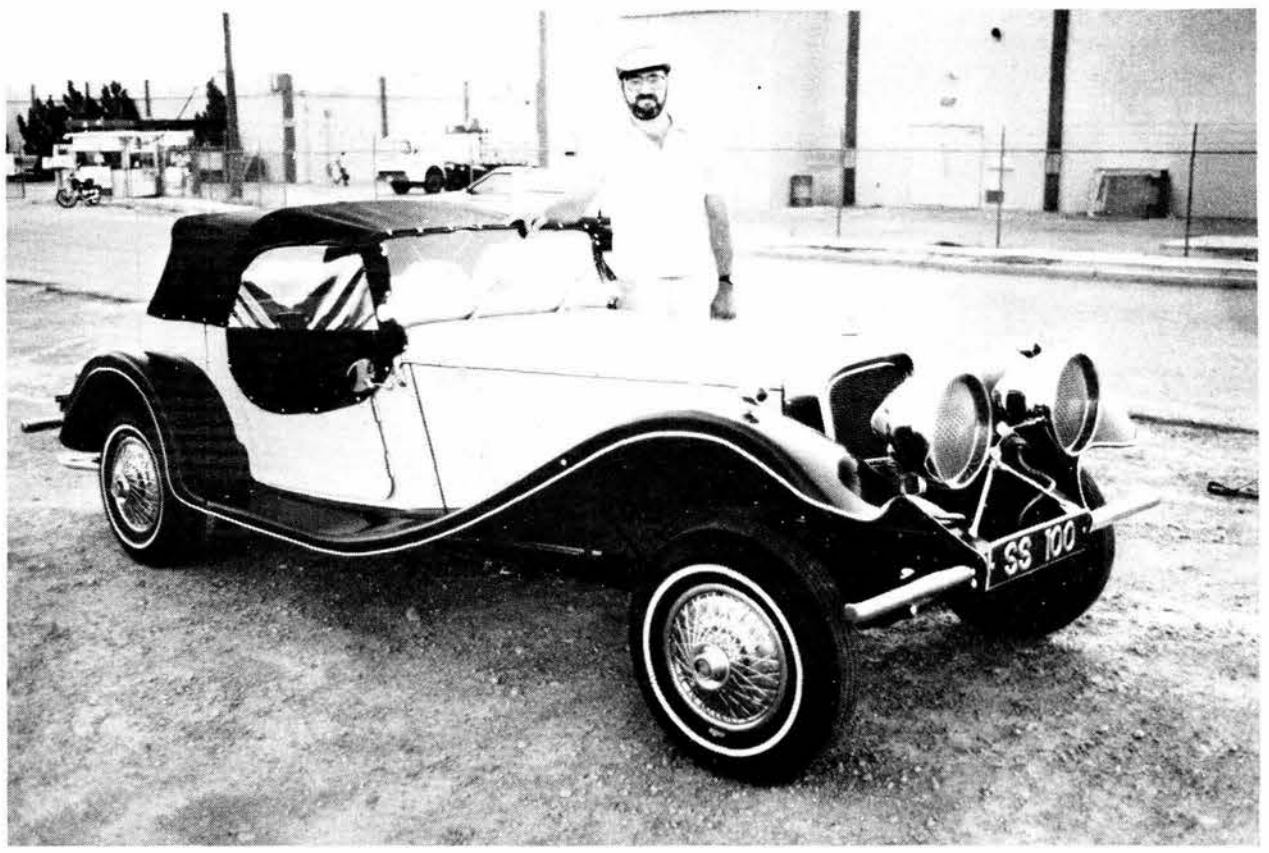
About the only thing that isn't new in the machine is the engine and drive train, which came out of a '74 Pinto. The rest is from a kit or purchased from an auto parts store.

It's a classy little machine — sparkling gray and black with long, rakish fender lines, big chrome headlights, a gleaming walnut instrument panel, and a long, low hood set off with a leaping, snarling jaguar.

The car represents fulfillment of two of Diwiatt's dreams. He had always wanted to build a car with his own hands (to prove he could do it) and he wanted one that was different, unlike the standard American car. Building the classic replica car from a kit satisfied both requirements.

Diwiatt ordered the kit from a company in Buffalo, New York. He paid $5000 for the body kit, another $1500 for the special frame. It arrived in 12 big boxes. He paid $250 for a "rusted out '74 Pinto station wagon that had a very good engine."

The kit came with a set of step-by-step instructions. No special tools were needed other than standard auto tools and an electric drill. Diwiatt started by cleaning the Pinto engine and drive train down to the bare metal. He assembled the frame, then dropped in the engine and transmission. He installed rack and pinion steering; modified the clutch; installed gearshift, brakes, brake lines and pedals, shocks, gas tank and fuel lines, firewall and insulation; and then added new wiring and electrical systems.



LAS VEGAS EYE-CATCHER — Diwiatt Barker (7171) displays his classic replica of a 1937 Jaguar SS100 that he built from a kit. The SS on the license stands for the Swallow Sidecar Company of England (forerunner to the Jaguar name); the 100 designates 100 mph. Only 309 of the machines were built in 1935-40. Diwiatt's car has a '74 Pinto engine and transmission.

Assembling the fenders and body panels onto the frame required drilling "many, many holes" for "many, many nuts and bolts." Measuring had to be precise, and a lot of painstaking sweat went into the process.

Finally, with the installation of the soft convertible top, the side window panels, and the interior seats and floormats, the great day arrived — it was time to fire it up. Diwiatt turned the key. Silence.

"I can't describe how I felt," Diwiatt says. " I just sat there. Numb. After a while I got out, lifted the hood, and started checking the electrical system. After about six hours, the answer came to me and I felt numb again. Stupidity. I had grounded the starter to the fiberglass firewall! I made a quick connection to the frame and tried it again. It started on the first turn and hasn't failed since."

"It drives like a dream," Diwiatt quickly adds, "quick, instant response, great cornering. It brings a lot of attention. I feel like I'm in a parade when I drive down the street."

Now that the building is finished, Diwiatt confesses that he enjoyed that part then as much as he enjoys driving now. "I was offered twice the money that I have invested in it during a recent car show," he says. "I'm thinking about maybe selling it and buying a new kit — a Diamonte classic touring car designed for a Cadillac running gear. Now that would be big....something fine to see....."

Ristromatic Trip

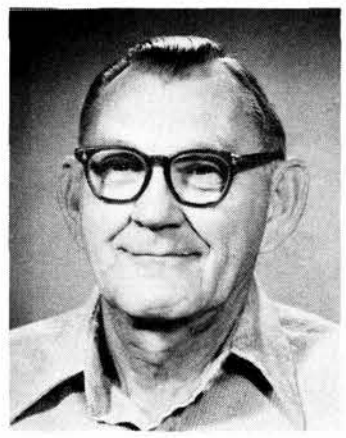
What happens when two four-foot strands of long, red chiles fly from warm Albuquerque via cool Los Angeles International to cooler San Francisco? Especially when they're wrapped in plastic, travel in an overhead, enclosed luggage rack and are smothered with coats and jackets? Well, like all self-respecting chiles, they sweat. Renee Wingerd, the embarrassed transporter (associate administrator for EE's Engineering Services Division), says it was an eternally aromatic trip.

from "Lab Life," in LLNL's *Quarterly* Magazine.

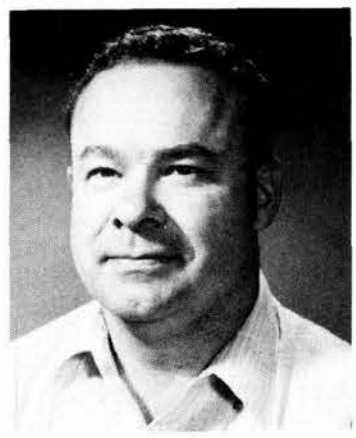
RUSS BROWN (7171) designed this dust-proof, all-weather cover for a mobile camera station at Tonopah Test Range. He used aluminum honeycomb panels and aluminum extrusions bonded with a structural adhesive. The cover is lightweight but strong enough to be used as a work platform when opened. A single operator using a geared handcrank can quickly open or close the structure.

MILEPOSTS
LAB NEWS

NOVEMBER, 1984

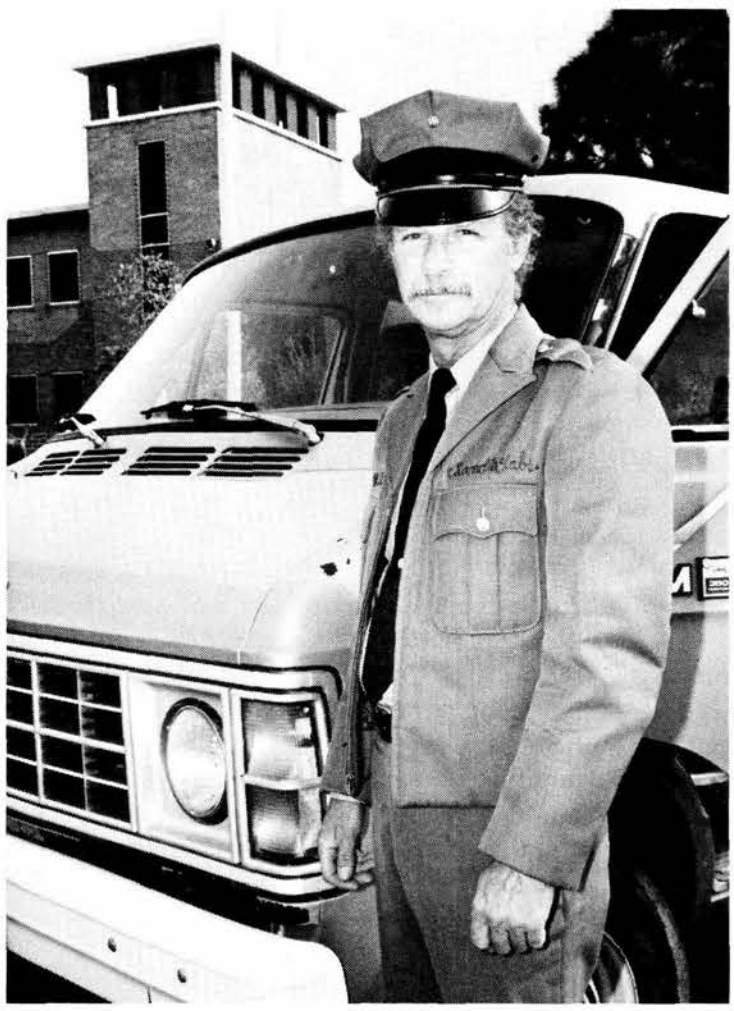


Roger Buehler (2343) 30



John Gieske (7552) 15

Joy Arnold (6241) 10



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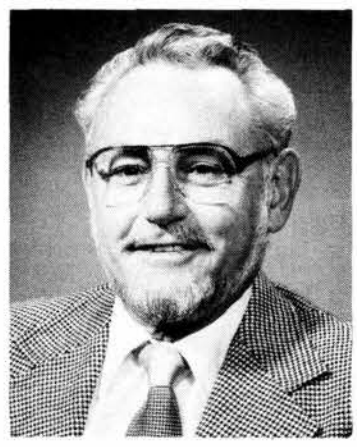
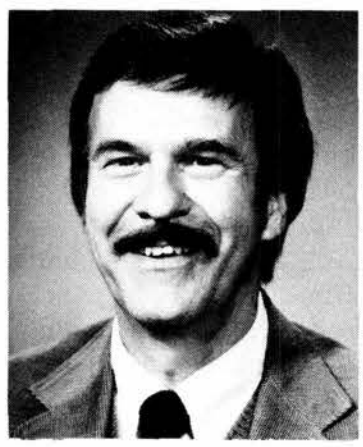
Sandra Anderson (7241) 15



Donn Stewart (7471) 20



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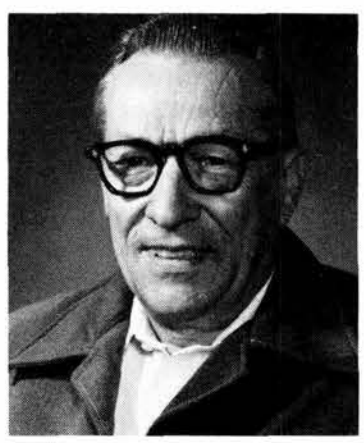
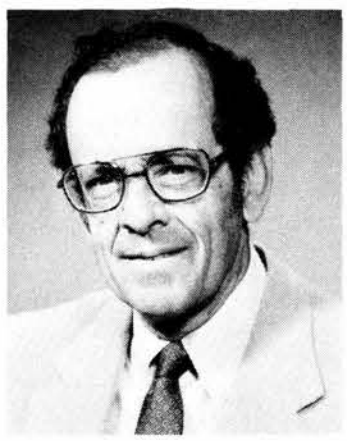
Murphy Landry (314) 20

Jesse Bozone (7253) 30



Vester Harker (5245) 20

D.M. Ellett (6332) 35



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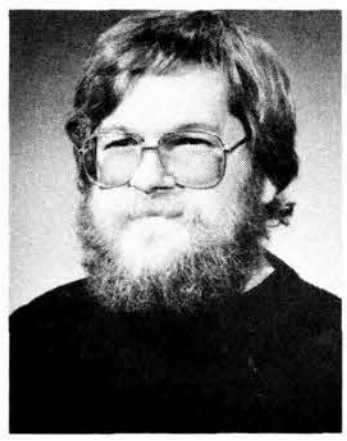

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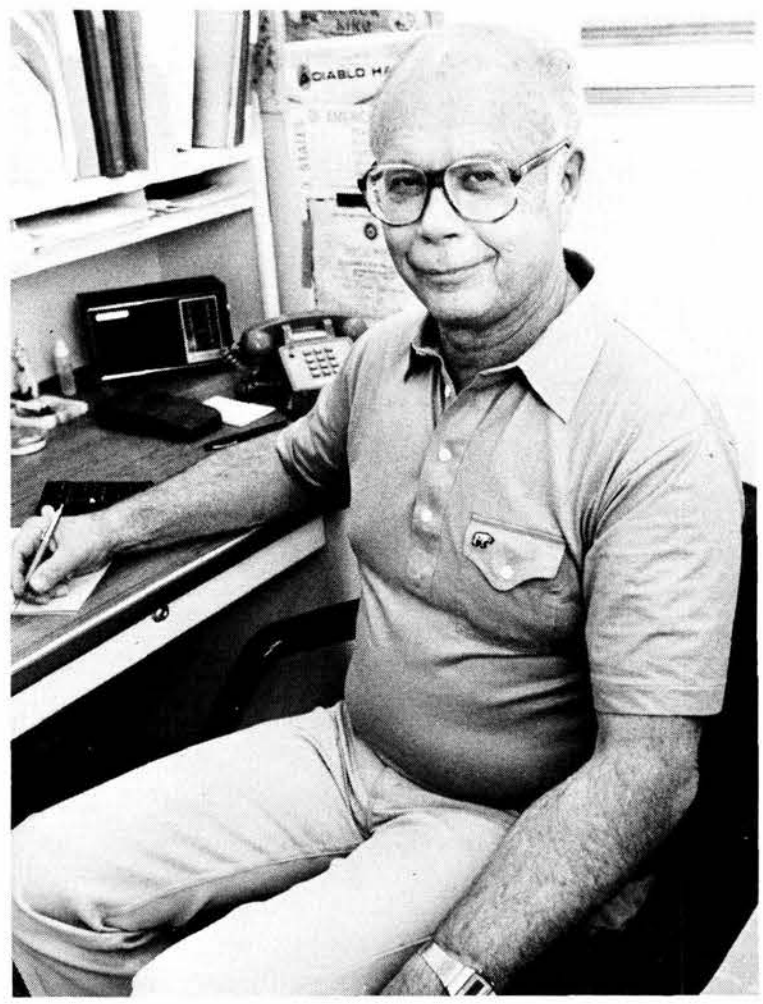
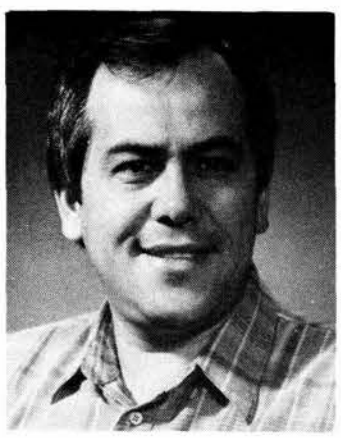
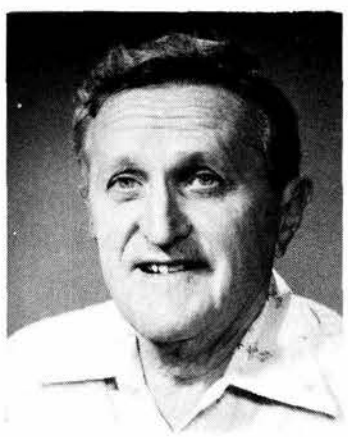


Clarence Mehl (7112) 30



Jose Montoya (7474) 10



Ed Neidel (2361) 35

Ken Wiley (7135) 35

Events Calendar

Nov. 8-11 — Ninth Annual Indian National Finals Rodeo. Miss Indian Rodeo and Pageant, Pow Wow, and trade fairs. Tingley Coliseum, State fairgrounds, 766-6552, 265-1791.

Nov. 9, 10, 16, 17 — Concerts at the KiMo: *Nov. 9* — Phil Woods Quintet, 8 p.m.; *Nov. 10* — "Variety is the Name of the Game," 8 p.m.; *Nov. 16* — Jo Ann Castle, contemporary music and honky-tonk piano, 7 & 9 p.m.; *Nov. 17* — Ballet Folklorico Mexicano, 8 p.m. 766-7816.

Nov. 11 — Armenian film "A Slap in the Face" (Armenian dialogue, English subtitles), 2 p.m., KiMo.

Nov. 14 — The Best of Broadway and International Theater: Mel Torme, Peter Nero, 8:15 p.m., Popejoy.

Nov. 16-18 — 12th Annual Southwest Arts and Crafts Festival, juried show, State fairgrounds Exhibit Hall, Fri. & Sat. 10-9, Sun. 10-6; 296-5591, 821-1313.

Nov. 18 — Music at the Museum: Dan Gwin, string bass recital, 3 p.m., Albuquerque Museum.

Nov. 18 — Movietime at the KiMo — Movies by Great Directors, "Ride the High Country," Sam Peckinpah (1962), 7 p.m., KiMo.

Nov. 20 — Green Grass Cloggers, concert and square dance after performance (workshop in p.m. for interested cloggers), 8 p.m., KiMo, reservations at 265-8959.

Nov. 23-25 — NM Symphony Orchestra and the Southwest Ballet, "Nutcracker Ballet," Fri. & Sat. 7:30 p.m., Sat. & Sun., 2 p.m., Popejoy, 842-8565.

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1. Limit 20 words.
2. One ad per issue per category.
3. Submit in writing. No phone-ins.
4. Use home telephone numbers.
5. For active and retired Sandians and DOE employees.
6. No commercial ads, please.
7. No more than two insertions of same ad.
8. Include name and organization.
9. Housing listed here for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

SANDIA T-shirts, caps, belt buckles; paperbacks, hardbacks, new books from UNM Press; color aerial photo of Sandia Labs. South Highway 14 Project, LAB NEWS, Bldg. 814.

SET of 50 Harvard Classics, genuine leather bound, collectors edition, new. Mason, 281-3052, 242-3447.

BASSETT 7-piece pecan dining suite; Flexsteel 2½ yr.-old queen sleeper sofa; 5-pc. butcher block look dinette. Troncoso, 897-1167.

CHILD'S gym set, includes swing, rings, & bars, $50. Boling, 298-8141.

ACCORDION, 120 bass Universal w/carrying case, $125; bumper carrier for small motorcycle, $15. Shaum, 821-0590.

WHITE spoke rims, 8x15, fits Chevy, 5-hole, 5" OC, 4 ea., $50. Knight, 836-7149.

AKC Airedale Terriers, avail. Nov. 18, $175. Kessel, 266-2094.

DOG HOUSES, matched set, pitched shingled roof, 23" wide, 32" long, 30" high, $15 each. Snelling, 255-9081.

WESTONE electric bass, new, w/case, $275 OBO. Johnson, 299-2186.

HAM gear: Swan 700-CX, mike, fan, extras, $225. Frenkel, 299-3258.

HELMETS: Bell 500TX, size 7½, w/visor, $30; Bell Shorty, size 7, w/flip-up shield, $25; both for $50. Reed, 268-7484.

TI #58-C programmable calculator w/master library, math utilities, & electrical engineering modules, complete w/all manuals. Coughenour, 294-3528.

2 BAR stools, high, brown cane backed w/brown leather seat, $35 ea. Valles, 299-4381.

HEATER by U.S. Stove, ¼" steel plate, brick lined, burns 30" logs, $345. Toya, 898-0491.

TWO air conditioners; hide-a-way bed; table & 4 chairs. Metoyer, 877-1893.

1903 TALKING Machine (Victrola) & many 78 records, best offer. O'Nell, 892-6754.

CHANDELIER, wagon wheel hub w/5 wrought iron arms, $75; Sears heatolator fireplace grate, 2 spd. fan, $75. Bauer, 266-8480.

TIFFANY light fixture, yellow stained glass, ceiling hung, holds 2 globes, $45. Barr, 821-5870.

COLOR TV, 19" Magnavox, $200. Duvall, 881-4406 after 5.

DRESSER, round mirror, $35; wood stove, $25; couch & chair, blue green, $80; sleeper couch, $50. Sanchez, 292-3852.

New Age Encyclopedias, almost new, bought for $650, sell for $400. Baldonado, 836-5281.

DESK w/secretary extension, $300; Thomas electric organ, $500. Roscoe, 884-4151.

SHRUB trimmer, cordless Diston Model 1035, w/power pack #1000, $20. Rainhart, 821-3690.

FISHER pool table & accessories, $350; commercial blind hemmer machine, $75; trailer hitch, $25. Melvin, 298-6402.

MOTOROLA mobile phone, paid $400, take best offer over $300; 13 cu. ft. refrig., $250. Walker, 281-9587, after 6.

DINETTE set, Kays 5-piece, $150; Poe table, $50; new Olympus 50mm lens, $30. Diem, 294-3503.

DOBERMAN, red, female, 4 yrs. old, to good home only, $25. Capps, 298-4144.

PARAKEET, free to good home, w/cage & food. Reda, 821-3817.

ELECTRIC MOTORS, sixth to three quarter HP, 3HP B & S gas engines. Meikle, 299-4640.

ORGAN, Kimbell Temptation, wide variety of rhythms & accompaniments, $2100. Kominiak, 898-4739.

LADIES ski boots, white Munari, size 6-6½, $45; white Hierling Princess, size 5, $60. Lassiter, 299-1492.

DOOR, garage, overhead 5-panel wood, all hardware, 7'H x 9' wide, $50; Tappan 4-unit elec. stove, counter top insert, $45. Browning, 299-6384.

BAND SAW w/motor, $50; router w/table, $40; 170mm K2 skis w/bindings, $50; child's ski boots, $5. Burd, 884-9133.

WIND BREAKER, Gore-Tex, REI, med. size, hood, worn twice, catalog $89, sell for $40. Shunny, 265-1620.

MUNARI ski boots, size 9½, $75. Brusseau, 256-0951.

PRINTER, Dynax DX-15 daisy wheel, extra ribbons, paper, parallel cable & instruction manual, $375. Schneider, 897-0565.

WINCHESTER rifle, Model 250 22 cal., lever action, pistol-grip type stock, $100. Smiel, 865-9081.

RECLINER, Stratolounger lo-back, swivel club chair, antique gold corduroy velvet upholstery. Weems, 281-5837.

TIRES, new, 2 ea., $65 each, P235/75R15 Firestone steel belted radials. Dobias, 256-7476.

TELSTAR call control system, $50; see pages 22-23 of fall/winter 84 AT&T Employee Sale catalog. Kraukar, 292-3917.

AUDIO equipment; Kenwood KA-8100 140 watt integrated amp; KLH Burwen Research TNE-7000 LP surface noise eliminator. Ritchey, 268-7620.

MATCHING lg. coffee & lamp table w/smoked glass tops, both $165. Rouckus, 266-8577.

CEILING FAN, 36", variable speed, $15. Hall, 298-8617.

CHINESE Shar Pei puppy, 9 wks. old, fawn, female, registered. Ericksen, 898-2208.

MCGRAW Edison 34" x 28" 2-spd. window mount swamp cooler, 1 yr. old, $175; dbl. bed w/mattress & boxspring, $25. Shaw, 299-8524.

MOVING BOXES, used once, UHaul, book size to dishpack, half price. Smith, 243-0714.

GE refrig., 14 cu. ft., $250; queen mattress, box & frame, $75. Levin, 299-0891.

STUDENT desk, 7-dwr, $50; dinette set, $35; elec. stove, $50. Cox, 298-0482.

IBM personal computer, 64K serial, parallel, color graphics, boards, one single-sided drive, $1250. Key, 296-0420.

SWIVEL rocker, green upholstery, $35; rust colored recliner, $40. Bisbee, 293-0356.

COUPONS for Continental airline ticket purchase, same as cash, 20% discount; wanted x-country skis & equip. Rexroth, 293-6025.

DESK (Sandia type), dbl. pedestal, tan w/brown woodgrain, $175; matching 2-dwr. file, $65. Newton, 296-2335.

WALL heater, adjustable electric, 5000 w/240V, fan driven, measures 31" L, 18" W, 11" D, $50 OBO. Kubiak, 265-6525.

TIRES, 5 radials, 15x12; Calif. kingsize waterbed mattress, waveless, 1 yr. old, make offer. Arana, 299-1214.

REMINGTON powerload actuated power stud driver w/(200) 2½" fasteners, (200) .22 HD powerloads, $70. Brammer, 266-5158.

P.A./HI-FI, Yamaha P2201 power amp, 200 WRMS/side, $650 OBO; Yamaha MQ-1202 12-channel board, $900 OBO. Smith, 883-4751.

CATS free to good home, male & female, both fixed, 4 yrs. old. Washington, 892-9615 after 6.

MATTRESS w/boxsprings & frame, queen size, $200 OBO. Skinner, 869-6609.

ACCORDION, Italian made, new, 120 bass, 10 stops, $575. Johnson, 884-0690.

DISHWASHER, KitchenAid, portable, white with butcher block top, $175; white double sink, $25. Hedlund, 255-9761.

SOFA SLEEPER, black naugahyde, $60; occasional chair, green fabric, $15; chrome dinette table, $15. Ligouri, 255-7551.

ALTO SAXOPHONE, Bundy, classical mouthpiece, cleaning accessories & reeds, $300. Anderson, 881-0934.

BASKETBALL season tickets, two, Section 25, Row 18, Seats 9-10. Martinez, 255-2598.

TRANSPORTATION

'77 JEEP Wagoneer, V8, 60K miles, AC, AT, PS, PB, aux. tank, cruise, new tires, brakes, $4200. Smith, 881-8464.

'76 DATSUN B210, 4-spd., AC, AM/FM cassette. Nagel, 298-2779.

MOTORCYCLE, Yamaha 80 dirt bike, $175. Schueler, 298-6124.

'79 PONTIAC Firebird, one owner, good mileage, stereo, T-top, louvers, below book, $4049. Gallegos, 345-7147, 344-3290.

'81 TOYOTA Tercel 2-dr. sedan, 5-spd., one owner, 40K miles, AM/FM stereo, $4000 OBO. Pritchard, 299-3543.

'74 CHEVROLET Suburban, ¾ ton, 4x4, dual, AC, PS, PB, trailering special, 9-pass., needs paint, $2695. Nogales, 268-8487.

'81 TOYOTA Corolla SR5 hatchback, AC, PS, sunroof, AM/FM. Harrison, 345-5166, 836-7259 after 5.

FUJI 12-spd., 27", almost new, $150. Smith, 281-2083.

'76 CHEVY ½ ton pickup, LWB, 6-cyl., 3-spd. manual, $2000. Toya, 898-0491.

'76 DATSUN B210, 4-spd., 2-dr., radio, $1400. Smith, 898-6181 after 6.

'84 HONDA Aero, 80cc scooter, 4 mos. old, 1200 miles, $800 OBO. Bovard, 822-0218.

'75 FORD Granada 4-dr., PS, AC, 250 cu., 56,500 miles, $1200. Sanchez, 292-3852.

'80 HONDA Prelude, 5-spd., sunroof, AC, AM/FM stereo, new upholstery, red, $5850. Herndon, 294-2678.

'83 HONDA 1100 (V-65 Magna motorcycle), 6K miles, $2500. Ulibarri, 883-2848.

GO-CART, Bird Eng. dirt cart, 5HP engine, spare parts, helmet, $230; Raleigh Rapide, 21" frame, 10-spd., boys bicycle, $110. Butcher, 884-4818.

BICYCLE, ladies, 3-spd., Sears Free Spirit, slightly used. Beardsley, 292-5910.

'79 KZ 1000 motorcycle, low mileage, $1500 OBO. Martinez, 884-1845.

'83 FORD Ranger, 4-cyl., 2.3 liter, AC, PS, 4-spd., radio, tool box, $6700 OBO. Gray, 268-0144.

'84 FIERO SE, PB, sunroof, AC, AM/FM/cass., tilt wheel, cruise, low mileage. Naro, 881-2621.

'64 FORD F-100 pickup w/'68 V8, 4-spd., camper shell, $800. Burd, 884-9133.

'69 DATSUN pickup, $900. Giddings, 281-3582.

'75 TOYOTA Corolla stn. wgn., AC, AM/FM, sheepskin cover. Weems, 281-5837.

'69 CHEVY ½ ton, SWB, 350, cam, dual exhaust, AT, mag wheels, radials, camper shell, FM/cass, $1250. Anderson, 292-5676.

'67 CHEVY Impala, AT, PS, PB, AC, 15 mpg in town, 8-track stereo, $675. Tjeltweed, 299-0032.

'73 CHEVROLET Nova, 2-dr., 307 engine, PS, AC, $800. Frank, 294-6577.

'75 CHEVY Nova, 2-dr., 6-cyl., PS, $1100. Kennedy, 298-0704.

BICYCLES: mens 5-spd. touring, tool pouch & pump, $55; ladies single spd., basket, $35; both have lights & generators. Newton, 296-2335.

'76 OLDSMOBILE Cutlass Brougham, fully equipped, retail $2200, sell $1900. Arana, 299-1214.

'80 FORD Pinto, low mileage, AT, AM/FM/tape stereo, $2200. Bedingfield, 268-3579.

'71 BMW R60/5, custom black with gold pinstriping, Windjammer, backrest, 67K miles, $1400 or trade (enduro, Ranchero, etc.). Paul, 296-3185.

'70 VW. Altwies, 865-9453 after 6.

'72 MERCURY CAPRI, 4-spd., 2-liter engine, $300 OBO. Anderson, 881-0934 after 5.

'83 HARLEY DAVIDSON XLX 1000, 5300 miles. Martinez, 344-8974.

'82 HONDA XR500, $1300; 3-motorcycle trailer, $300. Willis, 281-2572.

'73 PINTO station wagon, 4 cyl., original owner, $700. Lynch, 884-7977.

'64 VW Bug, $1200 OBO. Edmonds, 884-5974.

'81 RABBIT diesel, 31K miles, AC, radio, AM/FM cassette, 45 mpg, $300 below book. Meister, 266-5186.

'78 DODGE VAN, AC, AT, PB, PS, CC, AM-FM, new tires, aux. gas tank, $4900. Leonard, 884-8566.

REAL ESTATE

60' MH, 3-axle, built-in appliances, blonde oak wood interior, $3750, you move. Young, 865-6204 after 4.

'80 CENTURION MH, 14x60, refrig., gas stove, 2-bdr., front kitchen, $1600 down, assume mortgage. Bruce, 897-7416 after 5:30.

NE, 2-bdr., 780 sq. ft., 60' x 130' lot. Holcomb, 256-3329.

RIO RANCHO, 1400 sq. ft. on acre lot, 1¾ baths, 3-bdr., rock fp, landscaped, carpeted, custom drapes, stove & refrig., patio, dbl. converted garage, $75,500. O'Nell, 892-6754.

3-BDR., 2 full baths on fenced ½ acre in Rio Rancho, 11½% loan, negotiable down. Flores, 892-9199, 296-6096.

3-BDR., kitchen-dining, LR, laundry, den, carport, storage-shop bldg., lg. lot near Rio Grande HS, $52,900. Reich, 877-2846.

WANTED

EL TORO, Optimist, Sabot, or similar class sailboat, used. Woods, 884-4224.

ROUND, 36" wrought iron table & 2 chairs; bdr. dresser, approx. 4' high x 4' wide. Cook, 266-6740.

ROOMMATE, 3-bdr., 1½ bath, near Moon & Constitution, $275 plus ½ utilities. Kanniainen, 292-0148.

NEW Sandia employee would like house to housesit or rent, starting December. Curro, 867-2471.

LARGE aquarium (45 gals. or more) w/stand. Horton, 884-8989.

DEER hides, any size or condition. Wade, 869-3934.

Prime Rib Tonight; Buffet Tomorrow

TONIGHT At Happy Hour Enchantment, a good variety group, with Paul Metoyer (3435) on drums, makes the dancing music while Chef Henry Perez makes the two-for-one specials. You can order prime rib for two for $10.95 or broiled halibut for two for $8.95. Happy Hour prices (very reasonable) are in effect from 4:30 until the music starts at 8:30. Dining room hours are from 6 to 8:30.

TOMORROW is the biggie of the month, called Membership Night, and it features a super buffet (roast leg of lamp, steamship round of beef, chicken a la king) for $3.95 and 50-cent well drinks and beer all evening. On the bandstand Sam Griego (7481), fronting a swinging group called the Griego Brothers, will sing and play guitar. (You remember Sam from the ECP Hoedown). A couple of very entertaining young ladies will also contribute to the general good feeling of the evening — Robin Arquette will sing some current and upbeat songs during the cocktail hour and bellydancer/magician Janette Benedon will present the "Magic Dance Show" during intermission.

Also, and this is important, door prizes will be awarded. The big one is a family swim and patio ticket for next summer followed by a dinner for two at the Club and the last prize, flambe dessert for two. For reservations, call 265-6791 *right now.*

NEXT FRIDAY, Nov. 16, is another two-for-one special time in the dining room featuring filet mignon for $11.95 or fish and chips for $7.95. Karen Edwards will instruct free country dance lessons from 7:30 to 8:30. Deputy Dan will hold the bandstand playing sagebrush shuffle music.

CHRISTMAS SHOPPING might be a good reason to attend the Club's second annual Arts and Crafts Fair; enjoying the fruits of members' creativity might be another. Either way, hours are from 10 to 4 and everyone's invited to be there Saturday, Nov. 17. (Exhibition space may still be arranged. Call Mary Ann Biggs, 265-4661, or Betty Clendenin, 299-2071.)

ATTENTION RETIREES: Organization of a retirees special interest group as part of the Coronado Club program is set for Monday, Nov. 19, from 2 to 4 in the ballroom. All retirees are invited to help shape the new organization. Hors d'oeuvres will be served; a Happy Hour bar will be in operation.

CORONADO SKI CLUB meets Tuesday, Nov. 20, at 7 p.m. in the ballroom. Sue Finch, Ski Utah Association, is the speaker. She will discuss Utah ski facilities, particularly the ones the Ski Club plans to invade this year. Good prices, good prizes, and good entertainment will be part of the evening.

A LUNCHEON SPECIAL is planned in the Club dining room for Wednesday, Nov. 21. The lunch line will be serving carved roast turkey with all the trimmings, a Thanksgiving feast for $2.95. Mark it on your calendar now to remind you to dine out for lunch that day. Also, if you haven't already, check the beautiful new dining room tables and chairs.

SINGER ROBIN ARQUETTE will entertain during the cocktail hour at the Club's big Membership Night Nov. 10 and again during Happy Hour on Friday, Nov. 23. Robin plays guitar, sings current and upbeat songs.

THANKSGIVING is a Club holiday. All facilities will be closed. The following Friday, Nov. 23, Happy Hour will be observed in the main lounge with a free spread of munchies and goodies. Singer Robin Arquette will entertain.

TRAVEL — For members interested in travel at special discounts, arrangements have been completed with a local preferred traveler club to have dues waived for one year. Marv Plugge (5171), Club travel director, will have information available at the travel table in the Club lobby tonight between 6 and 7. Stop by and talk about a 12-day Alaska cruise starting June 2, an 8-day steamboat excursion on the Mississippi starting April 26, an 8-day golf package to Sea Pines starting May 11, or trips to Europe, the South Pacific, and the Mediterranean.

SANADO WOMEN meet for a luncheon at the Club on Tuesday, Nov. 13. Julia Saviteer will discuss family life in the pueblos. For reservations, call Norma Goodwin, 294-6702, today.

A FINANCIAL SEMINAR on "bond swapping" as an investment strategy will be conducted by Jim Zitzman of American First Financial on Tuesday, Nov. 20, at 7:30 p.m. in the ballroom. There is no admission charge.

Retiree Roundup

Retired Sandian Alan Pope has just completed an enlarged edition of his earlier college textbook *Wind Tunnel Testing* (1946). William Rae, University of Washington, is the senior author of the edition, *Low Speed Wind Tunnel Testing*, (John Wiley & Sons, NY).

Alan also continues to write about the financial scene. In the past 18 months he has written one book — *Successful Investing in No-Load Funds* (John Wiley & Sons, NY, 1983) — four magazine articles and three technical articles for the *Journal of the AAII.* Currently he's negotiating with a publisher who needs a monthly article on mutual funds. Alan spends the summers in Albuquerque and winters in Florida. He retired from the Labs in 1977.

volunteers in action

Here are a couple of current volunteer opportunities for employees, retirees, and family members. If you would like more information, call Karen Shane (4-3268).

ALBUQUERQUE CIVIC LIGHT OPERA ASSOCIATION needs a computer programmer to set up a dBase II software package for ticket sales and inventory.

NEW FUTURES, an advocate agency for school-age parents, is seeking a board member for its Vocational Advisory Committee.

Welcome

Albuquerque
- Gary Brown (6324)
- Kimberley Brown (3313)
- Margaret Duimstra (3426)
- William Frix (5347)
- Samuel Jones (3734)
- William King (5321)
- Victor Lovato (3426)
- James McKenney (2123)
- Lydia Perez (3733)
- Raymond Sedillo (3426)

Illinois
- Thomas Haill (2321)

Kansas
- Terry Guilinger (1841)

South Carolina
- Jed Heames (6447)

Virginia
- Charles Andraka (2541)

Sympathy

To Julie Garcia (7263) on the recent death of her grandfather in Albuquerque.

To Dennis Chavez (3745) on the death of his son in Albuquerque, Oct. 19.